What is claimed is:

1. A method for mechanochemical polishing, comprising:

preparing abrasive grains made of chromium (III) oxide; and

polishing a surface of a semiconductor wafer by mechanochemical polishing using the abrasive grains in a state where an oxidizing agent exists on the surface of the semiconductor wafer.

2. The method according to claim 1, wherein the oxidizing agent is an oxidizing chemical liquid.

3. The method according to claim 2, wherein the oxidizing chemical liquid is hydrogen peroxide water.

4. The method according to claim 2, wherein the oxidizing chemical agent is dropped to be supplied to the surface of the semiconductor wafer.

5. The method according to claim 1, wherein the oxidizing agent is a solid powder having an oxidizing function.

6. The method according to claim 5, wherein the solid powder includes at least one of manganese dioxide and dimanganese trioxide.

7. The method according to claim 5, wherein the surface of the semiconductor wafer is polished on a member that moves relatively to the semiconductor wafer, the member holding the solid powder thereon.

8. The method according to claim 5, wherein the solid powder is dispersed in a liquid that is dropped to be supplied to the surface of the semiconductor wafer.

9. The method according to claim 1, wherein the oxidizing agent is a gas containing oxygen.

10. The method according to claim 9, wherein the gas contains one of oxygen gas and water vapor.

11. The method according to claim 9, wherein the gas is sprayed to a member for polishing the surface of the semiconductor wafer to be supplied to the surface.

12. The method according to claim 9, wherein:
the surface of the semiconductor wafer is polished on a member that is moved relatively with respect to the semiconductor wafer; and
the gas is supplied to the surface of the semiconductor wafer through the member.

13. The method according to claim 9, wherein the

surface of the semiconductor wafer is polished in an atmosphere including the gas so that the gas is supplied to the surface of the semiconductor wafer.

14. The method according to claim 1, wherein a solid powder made of a material other than chromium (III) oxide is supplied to the surface of the semiconductor wafer when the surface is polished, the material having a function for catalyzing a chemical reaction.

15. The method according to claim 14, wherein the solid powder is dispersed in a liquid that is dropped to be supplied to the surface of the semiconductor wafer.

16. The method according to claim 14, wherein the solid powder is disposed on a member that is moved relatively with respect to the surface of the semiconductor wafer in contact with the surface when the surface is polished.

17. The method according to claim 14, wherein the solid powder contains at least one of titanium dioxide, cadmium sulfide, and diindium trioxide.

18. The method according to claim 14, wherein the solid powder is irradiated with light when the surface of the semiconductor wafer is polished.

19. The method according to claim 1, wherein the surface of the semiconductor wafer is polished while being heated.

20. The method according to claim 1, wherein the semiconductor wafer is made of silicon carbide.

21. The method according to claim 1, wherein the surface of the semiconductor wafer is polished with a processing pressure in a range of 0.0098 to 0.294 MPa (0.1 to 3.0 Kgf/cm^2).

22. A mechanochemical polishing apparatus, comprising:

a holding table for holding a semiconductor wafer thereon;

a member facing the holding table and movable relatively with respect to the semiconductor wafer held on the holding table to polish a surface of the semiconductor wafer using abrasive grains made of chromium (III) oxide; and

oxidizing agent supply means for supplying an oxidizing agent to the surface of the semiconductor.

23. The apparatus according to claim 22, wherein said oxidizing agent supply means is an injector disposed above the member for supplying the oxidizing agent to the surface.

24. The apparatus according to claim 23, wherein the oxidizing agent supplied to the surface through the injector is one of an oxidizing chemical liquid and an oxidizing gas.

25. The apparatus according to claim 22, wherein the member serves as said oxidizing agent supply means and holds a solid powder as the oxidizing agent thereon.

26. The apparatus according to claim 22, wherein said oxidizing agent supply means is a hermetically sealed vessel accommodating therein the holding table holding the semiconductor wafer and the member, and having an atmosphere including an oxidizing gas as the oxidizing agent.

27. The apparatus according to claim 22, wherein said oxidizing agent supply means is a passage provided in the member and supplies an oxidizing gas as the oxidizing agent toward the surface of the semiconductor wafer through the passage.

28. The apparatus according to claim 22, further comprising heating means for heating the surface of the semiconductor wafer when the surface is polished.

29. The apparatus according to claim 22, further comprising an injector for supplying a liquid to the surface

of the semiconductor wafer, the liquid including a solid powder made of a material other than chromium (III) oxide, for catalyzing a chemical reaction.

30. The apparatus according to claim 29, wherein the injector serves as the oxidizing supply means and supplies the oxidizing agent together with the solid powder, to the surface of the semiconductor wafer.

31. The apparatus according to claim 29, further comprising a light source for irradiating the solid powder with light.

32. The apparatus according to claim 22, wherein the member holds a solid powder made of a material other than chromium (III) oxide, for catalyzing a chemical reaction.

33. The apparatus according to claim 32, further comprising a light source for irradiating the solid powder with light.

34. The apparatus according to claim 22, wherein the member has a polishing cloth on a surface thereof for polishing the surface of the semiconductor wafer.

35. The apparatus according to claim 34, wherein the polishing cloth has a cavity that is continuous in a

direction perpendicular to the surface of the member.

36. The apparatus according to claim 34, wherein the polishing cloth is made of one selected from a group consisting of synthetic fibers, glass fibers, natural fibers, synthetic resin and natural resin.

37. The apparatus according to claim 34, wherein the polishing cloth is a suede type, made of polyurethane, and has a perpendicularly foamed structure;

38. The apparatus according to claim 34, wherein the polishing cloth includes an unwoven type polishing cloth in which complex fabric bodies are impregnated with resin serving as a binding material between fibers or in which a resin layer has a continuously foamed structure.

39. The apparatus according to claim 38, the polishing cloth includes the unwoven type polishing cloth and a suede type polishing cloth bonded to the unwoven type polishing cloth at a side of the semiconductor wafer, the suede type polishing cloth being made of polyurethane and having a perpendicularly foamed structure.

40. The apparatus according to claim 34, wherein the polishing cloth has a plurality of cavities at the surface and an inside thereof, the plurality of cavities being

independent from each other.

41. The apparatus according to claim 40, wherein the polishing cloth is made of one of synthetic resin and natural resin.

42. The apparatus according to claim 41, wherein the polishing cloth is made of formed polyurethane.

43. The apparatus according to claim 34, wherein the polishing cloth includes a first cloth disposed on the surface of the member and including a cavity that is continuous in a direction perpendicular to the surface of the member, and a second cloth bonded to the first cloth at an opposite side of the member and including a plurality of cavities independent from each other at a surface and an inside thereof.

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